



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/625,480

07/22/2003

Ling Chen

5335.C1

9106

7590

08/31/2004

Patent Counsel
APPLIED MATERIALS, INC.
P.O. Box 450A
Santa Clara, CA 95052

EXAMINER

DANG, PHUC T

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 08/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center">Office Action Summary</p>	Application No. 10/625,480		Applicant(s) CHEN ET AL.	
	Examiner PHUC T DANG		Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4-7 is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 2818

DETAILED ACTION

1. This application is a CON of 09/851,519 filed on May 7, 2001 (U.S. Patent No. 6,596,643).

Oath/Declaration

2. The oath/declaration filed on December 23, 2003 is acceptable.

Specification

3. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al.

Regarding claim 1, Cheng et al. discloses a method of processing a substrate having a low k dielectric material layer formed thereover, comprising :

forming a titanium silicon nitride layer (18, Fig. 3) by chemical vapor deposition over the low k dielectric material layer (14, Fig. 3); and

depositing a copper seed layer (20, Fig. 3) over the titanium silicon nitride layer (18, Fig. 3) .

Art Unit: 2818

Cheng et al. discloses the features of the claimed invention as discussed above, but does not disclose a step of forming the low k dielectric material layer and a step of depositing a copper seed layer by physical vapor deposition.

Forming the low k dielectric material layer and depositing a copper seed layer by physical vapor deposition are considered to be obvious in design of choice, since any kind of material could have any dielectric constant and could deposit by any way depending on the process. Thus, it would have been obvious to one having ordinary skilled in the art at the time the invention was made to form the low k dielectric material layer and deposit a copper seed layer by physical vapor deposition as suggested in Cheng et al. in col. 5, lines 33-34 for a purpose of improving the process.

Regarding claim 3, cheng et al. discloses the titanium silicon nitride is formed to a thickness of between about 5 Angstroms and a bout 100 Angstroms [col. 5, lines 9-13].

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. in view of Tsubouchi et al. (U.S. Patent No. 6,495,461 B2).

Cheng et al. discloses the features of the claimed invention as discussed above, but does not disclose a step of forming the titanium silicon nitride at a substrate temperature between about 320°C and about 370°C.

Tsubouchi et al., however, discloses a step of forming the titanium silicon nitride at a substrate temperature between about 320°C and about 370°C [col. 11, lines 13-17].

It would have been obvious to one having ordinary skilled in the art at the time the invention was made to apply the teaching of Tsubouchi et al. to Cheng et al. discussed above

Art Unit: 2818

such that a step of forming the titanium silicon nitride at a substrate temperature between about 320°C and about 370°C for a purpose of improving the process.

Allowable Subject Matter

6. Claims 4-7 would be allowed.

The following is a statement of reason for the indication of allowable subject matter:

Claims 4-7 are considered allowable since the prior art of record and the considered pertinent to the applicant's disclosure does not teach or suggest the claimed invention. None of the prior art of records discloses a step of depositing a titanium nitride layer over the low k dielectric material layer by providing a titanium-containing compound and a nitrogen-containing compound.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuc T. Dang whose telephone number is (571) 272-1776. The examiner can normally be reached on 8:00 am-5:00 pm.

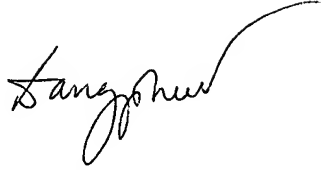
8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Nelms can be reached on (571) 272-1787. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and After Final communications.

9. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Art Unit: 2818

Phuc T. Dang

PD

A handwritten signature in black ink, appearing to read "Phuc T. Dang", with a long, sweeping horizontal stroke extending to the right.

Primary Examiner

Art Unit 2818